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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/818,193	03/26/2001	Gilyong Chung	2026.000900/VU0037	3973

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EXAMINER

FOONG, SUK SAN

ART UNIT PAPER NUMBER

2823

DATE MAILED: 10/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/818,193

Applicant(s)

CHUNG ET AL.

Examiner

Suk-San Foong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☒ Claim(s) 22-26 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) ✓
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Objections

2. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 21-25 been renumbered 22-26.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 6, it is questioned what is recited through the term "10% HF". The basis must be recited (e.g. by weight or volume, etc.)

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

7. Claims 1, 2, 4, 5, 7, 8, 10, 11, 19, 20, and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Li et al.

Li et al. teach forming a semiconductor device which includes providing a p-type 4H-SiC wafer (p. 279, and paragraph 3), then cleaning the wafer and followed by dipping in 1% HF solution, subsequently oxidizing the 4H-SiC wafer at 1150°C thereby forming silicon dioxide layer on wafer, and then annealing the wafer in NO (nitric oxide) at 1130°C for 1.5 hours.

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In regard to claims 8 and 11, the oxidizing temperature and annealing temperature and duration are within the recited ranges.

8. Claims 1, 3, 4, 5, 7, 8, 10, 11, 19, 21, and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Lai et al.

Lai et al. teach a method of forming a semiconductor device which includes providing n-type 6H-SiC wafer (p. 3744, and paragraph 2), then cleaning the wafer using conventional RCA process and dipping in 1% HF solution, subsequently thermally oxidizing the wafer at 1100°C to form silicon dioxide, and subsequently annealing in N₂O (nitrous oxide) at 1100°C for 1.5 hours.

In regard to claims 8 and 11, the oxidizing temperature and annealing temperature and duration are within the recited ranges.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

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the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 6, 9, 12, 14, 15, 16-18, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. as applied to claims 1, 2, 4, 5, 7, 8, 10, 11, 19, 20, and 22 above.

Li et al. do not disclose cleaning silicon carbide substrate with 10% HF recited in claim 6.

Li et al. do not disclose the step as recited in claims 9 and 26.

Li et al. do not disclose the steps as recited in claims 12, 14 and 15.

Li et al. do not disclose the steps as recited in claims 16-18, and 23-25.

With respect to claim 6, the choice of cleaning of silicon carbide substrate with 10% HF would have been a matter of routine optimization to achieve the desired device and the desired device characteristics of the device to be formed. (See MPEP 2144.05)

With respect to claims 9 and 26, the choice of thickness of silicon dioxide layer would have been a matter of routine optimization to achieve the desired device densities on the finished wafer and the desired device characteristics of the device. (See MPEP 2144.05)

With respect to claims 12, 14 and 15, one of ordinary skill in the art would have been motivated to arrive at selected temperature and duration recited in claims 12, 14, and 15 for use in the process through routine experimentation depending on the desired device dimension and device characteristics.

With respect to claims 16-18, and 23-25, the results recited would be obtained by the process made obvious through routine optimization as discussed above because same materials would be treated in the same manner as in the instant invention.

12. Claims 6, 9, 12, 14, 15, 16-18, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lai et al. as applied to claims 1, 3, 4, 5, 7, 8, 10, 11, 19, 21, and 22 above.

Li et al. do not disclose cleaning silicon carbide substrate with 10% HF recited in claim 6.

Li et al. do not disclose the step as recited in claims 9 and 26.

Li et al. do not disclose the steps as recited in claims 12, 14 and 15.

Li et al. do not disclose the steps as recited in claims 16-18, and 23-25.

With respect to claim 6, the choice of cleaning of silicon carbide substrate with 10% HF would have been a matter of routine optimization to achieve the desired device and the desired device characteristics of the device to be formed. (See MPEP 2144.05)

With respect to claims 9 and 26, the choice of thickness of silicon dioxide layer would have been a matter of routine optimization to achieve the desired device densities on the finished wafer and the desired device characteristics of the device. (See MPEP 2144.05)

With respect to claims 12, 14 and 15, one of ordinary skill in the art would have been motivated to arrive at selected temperature and duration recited in claims 12, 14, and 15 for use in the process through routine experimentation depending on the desired device dimension and device characteristics.

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With respect to claims 16-18, and 23-25, the results recited would be obtained by the process made obvious through routine optimization as discussed above because same materials would be treated in the same manner as in the instant invention.

13. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lai et al. as applied to claims 1-12 and 13-26 above, and further in view of Kashiwagi ('172).

Lai et al. do not teach annealing in NH_3 or ammonia.

Kashiwagi suggests NH_3 or ammonia to be used as an alternative to N_2O or NO in nitridation of oxide layers to be used as dielectric or gate oxide.

It would have been within the scope to one ordinary skill in the art to combine both teachings because it would achieve the nitridation step to be performed.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suk-San Foong whose telephone number is 703-305-0383. The examiner can normally be reached on Monday to Friday.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for the

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organization where this application or proceeding is assigned are 703-308-7722 (7724, 3431, 3432).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

September 26, 2002


George Fourson
Primary Examiner
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